



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/SE90/00344</p> <p>(22) International Filing Date: 22 May 1990 (22.05.90)</p> <p>(30) Priority data: 8901852-7      24 May 1989 (24.05.89)      SE</p> <p>(71) Applicant (for all designated States except US): INTERNATIONAL TRANSPORT SYSTEM DEVELOPMENT AB [SE/SE]; Box 26042, S-750 26 Uppsala (SE).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only) : CARLSSON, Ingemar [SE/SE]; Kåxle, Bäckatorp, S-716 91 Fjugesta (SE).</p> <p>(74) Agents: AXELSSON, Rolf et al.; Kransell &amp; Wennborg AB, Sandhamnsgatan 42, S-115 28 Stockholm (SE).</p>		<p>(81) Designated States: AT (European patent), AU, BE (European patent), CA, CH (European patent), DE (European patent)*, DK (European patent), ES (European patent), FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent), US.</p> <p>Published With international search report.</p>
<p>(54) Title: AN ARRANGEMENT IN GOODS VEHICLES</p> <div data-bbox="406 1113 1250 1638"> </div> <p>(57) Abstract</p> <p>This invention relates to an arrangement in goods vehicles for handling load-units, such as skips, containers, cisterns and like load-carrying devices. The arrangement comprises a tilt-frame (3) pivotally mounted on the rear part of the vehicle (1) and a carriage (7) which is movable along the tilt-frame and which is intended for coaction with the load units (2). The arrangement includes at least two mutually adjacent hydraulic piston-cylinder assemblies (8, 9) which function to maneuver the carriage (7) and which are mechanically connected together in a manner to enable the carriage (7) to be moved through a distance which corresponds substantially to the combined lengths of stroke of the piston-cylinder assemblies. In accordance with the invention, the piston rods (10, 11) of both assemblies (8, 9) are provided with two hydraulic-fluid passageways (21, 26; 22, 27) which communicate with spaces on mutually different sides of the pistons (24, 25) in respective cylinders.</p>		

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An arrangement in goods vehicles

The present invention relates to a load-handling arrangement incorporated in goods vehicles, such as lorries and trucks for instance and intended for loading and unloading load-units, by which is meant loads in the form of demountable skips, containers, cisterns and the like, said arrangement including a tilt-frame which is pivotally mounted on the rear part of the vehicle, and a carriage unit which is movable along the tilt-frame and which coacts with the load units, said carriage being manouvered with the aid of at least two mutually adjacent hydraulic piston-cylinder assemblies which are interlinked mechanically so that the carriage can be moved through a distance corresponding substantially to the combined length of working stroke of the piston-cylinder-assemblies.

From the aspect of time and costs, among other things, it has become progressively more usual to adapt goods vehicles in a manner which will enable said vehicles to be used for the transportation of so-called demountable load-units such as pre-filled skips, containers, cisterns or the like, normally referred to as load-unit handling, and thereby render it unnecessary to produce a custom-built vehicle for a given form of transportation or for the vehicle to remain stationary over prolonged periods in order to load goods onto or offload goods from the actual platform of the vehicle concerned.

To this end, the goods vehicle is normally fitted with a robust frame which can be tilted about a tilting axle at the rear end of the vehicle, with the aid of hydraulic tilting piston-cylinder-assemblies. When loading or unloading a demountable load-unit onto or from the vehicle, the frame is tilted so as to form a given angle

with the ground, whereafter the demountable load-unit is drawn-up onto or pushed-down from the frame with the aid of a carriage which is movable along said frame and provided with a lifting-and-holding hook device intended for coaction with the demountable load-unit.

Movement of the carriage along the tilt-frame is normally effected with the aid of a chain-driven mechanism of a kind similar to that used in fork-lift trucks. One of the drawbacks with the use of chains is that chains require continuous maintenance, including lubrication and cleaning, resulting in high maintenance costs. Arrangements which incorporate chains also result in relatively high manufacturing costs and in heavy constructions. It is of primary interest in the case of goods vehicles to reduce the weight of ancillary equipment, so as to increase correspondingly the weight of the useful load capable of being carried by the vehicle.

The use of a chain-driven carriage also means that the carriage must have connected thereto flexible, hydraulic lines of variable length for manouvering the hydraulically operated devices which are provided for lifting and locking the demountable load-unit onto the tilt-frame and which accompany movement of the carriage. The use of flexible hydraulic hoses always presents a certain safety hazard and increases the risk of disturbances in operation.

With the intention of avoiding the use of chains, endeavours have been made to move the carriage along the tilt-frame with the aid of hydraulic piston-cylinder-assemblies. Problems, however, have arisen as a result of the long lengths of working strokes required of such assemblies, in combination with the forces necessary to

carry out such work. The use of telescopic piston-cylinder assemblies has been proposed in this regard. When constructed for the lengths of stroke and forces required in the present context, telescopic cylinders  
5 become extremely bulky and heavy, however.

The main object of the present invention is to provide a relatively light and simple construction operative to move the carriage along a tilt-frame with the aid of  
10 hydraulic piston-cylinder-assemblies. In keeping with the inventive concept, the construction shall also be configured so as to obviate the need for flexible hydraulic lines for transferring hydraulic fluid between the various driven piston-cylinder-assemblies and be-  
15 tween said assemblies and auxiliary piston-cylinder-assemblies mounted on the carriage.

To this end, an arrangement of the kind described in the first paragraph of the specification is particularly  
20 characterized in that the piston rods of the two piston-cylinder-assemblies are configured with two hydraulic-fluid passageways which communicate with spaces on different sides of the piston in respective assemblies.

25 This construction enables fluid to be supplied to both the driving piston-cylinder-assemblies and the hydraulic devices mounted on the carriage with the aid of hydraulic lines of fixed lengths.

30 In accordance with one advantageous embodiment, the two piston-cylinder-assemblies are fixated mechanically in relation to one another and are hydraulically connected in parallel with the aid of hydraulic lines of fixed lengths.

35 In accordance with one preferred embodiment of an ar-

5 rangement constructed in accordance with the invention, one piston rod is connected to the tilt-frame and the other piston rod to the carriage, and both of said piston rods are provided with means for connection to said fluid passageways at their outer ends.

10 An alternative embodiment which provides essentially the same advantages is characterized in that one piston-cylinder-assembly is connected to the tilt-frame, in that the second piston-cylinder-assembly is connected to the piston rod of the first piston-cylinder-assembly, in that the piston rod of the second piston-cylinder-assembly is connected to the carriage, and in that the last mentioned piston rod is provided with means for connection to said fluid passageways at its outer end .

15 In this embodiment, said one piston-cylinder-assembly is provided with fixed connections for pressure fluid and return fluid.

20 The fluid passageways in the piston rod connected to the carriage are preferably connected with hydraulic devices mounted on the carriage, said connection being effected via electrically switchable valve devices. These hydraulic devices may include devices for lifting a load unit onto the tilt-frame, and can be subjected to pressure so as to carry-out a lifting movement when the piston rods are urged to their retracted positions in respective cylinders.

30 The lifting devices preferably include a gripping hook having a pivotal locking arm which is intended to close the hook in coaction with the load unit to be lifted, thereby providing a reliable, self-locking function.

35 For the purpose of tilting the tilt-frame, it is pre-

ferred that the arrangement includes at least one telescopic piston-cylinder-assembly operative to initiate tilting of said frame, and that the position of the outer end of the piston rod of said telescopic piston-cylinder-assembly is controlled with the aid of a rod which is pivotable about the tilting axle of the frame, said end of said piston rod coacting with a seat on said frame.

10 The invention will now be described in more detail with reference to an exemplifying embodiment thereof illustrated in the accompanying drawings, in which Figure 1 illustrates a lorry carrying a demountable load-unit;

15 Figure 2 illustrates schematically a tilt-frame with associated working carriage mounted on the lorry; Figure 3 is a sectional view of the carriage in the position illustrated in Figure 2; Figure 4 illustrates the mutual connection of the drive piston-cylinder-assemblies of the carriage;

20 Figure 5 illustrates schematically the initiation of a tilting-frame tilting movement; Figure 6 is a sectional view of the carriage in the position shown in Figure 5; and

25 Figure 7 illustrates a continuation of the tilting movement.

Figure 1 illustrates a goods vehicle or lorry 1 on which there is mounted a demountable load-unit 2, which may have the form of a skip and which rests on a tilt-frame 3 which can be tilted about a rear pivot axle 4. The reference numeral 5 identifies the vertical leg of a substantially L-shaped lifting-and-locking device which is pivotally mounted on a working carriage which is

30

35 movable along the tilt-frame 3.

As shown in Figure 2, the tilt-frame 3 includes two longitudinally extending, U-shaped side-beams 6 in which a slide in the form of a carriage 7 can be moved reciprocatingly in the longitudinal direction of said beams.

5

In the case of the illustrated embodiment, movement of the carriage 7 is effected by means of two mutually adjacent hydraulic piston-cylinder-assemblies, the cylinder housings 8 and 9 of which are mechanically connected together. The piston rod 10 of the lower piston-cylinder-assembly is attached to the rear end of the tilt-frame, whereas the piston rod 11 of the upper piston-cylinder-assembly is attached to the forward end of the carriage 7. The reference numeral 12 identifies means for slidably supporting and guiding the piston-cylinder-assemblies in the side-beams 6.

The carriage-carried arrangement for lifting and locking a demountable load-unit on the tilt-frame includes the aforesaid L-shaped device having a vertical leg 5 and a substantially horizontal leg 13, which is pivotal about a pivot axle 14, see also Figure 3. The L-shaped device can be swung around said axle by means of pivotally connected, hydraulic piston-cylinder-assemblies 15. The reference numeral 16 identifies a hook device comprising a self-locking actuator arm 17, as described in more detail herebelow.

Tilting movement of the frame 3 is initiated with the aid of two telescopic, hydraulic piston-cylinder-assemblies 18 of restricted length of stroke, only one of which assemblies can be seen in the Figure 2 illustration. When the maximum length of stroke of these piston-cylinder-assemblies is reached, the tilting function is taken over by a main tilting piston-cylinder-assembly 19

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mounted on each side of the frame, as described in more detail herebelow. The reference numeral 20 identifies two pivotal roller-pairs which are intended for coaction with rails on the demountable load-unit to be drawn-up  
5 onto the tilt-frame. These pivotal roller-pairs reduce punctiform loading of the load-supporting platform of the vehicle concerned.

For the sake of clarity, the carriage 7 is shown in  
10 Figure 2 in a forward position with the pistons of the hydraulic piston-cylinder-assemblies extended to a maximum. When lifting a load-unit onto the tilt-frame 3, the carriage, however, will be located in its other  
15 terminal position, with the piston rods of said assemblies retracted in their respective cylinder housings, see Figure 4.

As illustrated in Figure 4, the piston rods 10 and 11 are provided with two coaxial passageways of which, for  
20 instance, the central passageways 21 and 22 also extend through associated pistons 24 and 25 respectively. The surrounding passageways 26 and 27 communicate with the space located inwardly of respective pistons. The piston rod 10, which according to the foregoing is stationary  
25 and is connected to the tilt-frame 3, is provided with fixed connections 28 and 29 for connection to the coaxial passageways 21 and 26 respectively. Movement of the carriage connected to the movable piston rod 11 along the tilt-frame is effected by supplying pressure fluid  
30 to the connection 28 while connecting the connection 29 to the reservoir at the same time. Pressure fluid will therewith act between the piston 24 and the cylinder housing 8 and move the housing relative to the piston. The cylinder housing 9 is caused to accompany this  
35 movement. Pressure fluid is also supplied through a line 30 to the space located between the piston 25 and the

5 cylinder housing 9, therewith causing the piston rod 11 to be extended from the cylinder housing 9. The return fluid is fed from the cylinder housing 9, through a line 31 to the cylinder housing 8, and passes out through the connection 29 via the outer passageway 26 in the piston rod 10. The carriage will therewith be moved to the position shown in Figure 2.

10 Return movement of the carriage is effected by switching the connections 28 and 29, such as to connect the connection 29 to the pump and the connection 28 to the reservoir. The pistons will therewith return to the position illustrated in Figure 4 while returning the carriage.

15 The aforesaid function is thus achieved without the use of flexible hydraulic lines.

20 As mentioned in the foregoing, the piston rod 11 is provided with two coaxial passageways which enable manouvering of the hydraulically operated lifting-and-locking device mounted on the carriage 7 which is connected to the piston rod 11. Subsequent to the piston rod 11 having been urged outwards to its extended terminal position with the aid of pressure fluid supplied through the supply line 30, this passageway arrangement enables pressure fluid to be supplied to selected hydraulic devices on the carriage, through the centre passageway 22, a fixed connection 32 and an electrically switchable valve mounted on the carriage. Return fluid returns through the connection 33, the outer passageway 27 in the piston rod 11, and the line 31 to the reservoir connection 29 on the piston rod 10.

35 Correspondingly, when the piston rods have been urged into their retracted positions in respective cylinder

housings, the restoring pressure applied to the cylinder housing 9 via the line 31 can be utilized to manouver hydraulic devices on the carriage, said devices being supplied through the connection 33 whereas return fluid is delivered to the connection 32 and the central passageway 22 in the piston rod 11 and to the connection 28 on the piston rod 10, via the line 30.

As will be understood, the hydraulic devices on the movable carriage can also be supplied with hydraulic working fluid via the stationary connections 28 and 29, without the use of flexible hydraulic lines, which is highly advantageous.

As an alternative to the illustrated embodiment in which the cylinder housings are mutually connected, the cylinder housing 8 can be turned and the rear end of said housing connected stationarily to the tilt-frame, and to mount the upper cylinder housing 9 at the piston rod of the lower piston-cylinder-assembly. The piston rod of the upper piston-cylinder-assembly is connected with the carriage, as in the earlier case. This embodiment also avoids the use of flexible hydraulic lines.

When using the described arrangement for lifting a load unit, for instance a demountable load-unit onto the goods vehicle, the tilt-frame 3 is tilted-up in the manner illustrated in Figure 5. This tilting movement is initiated by means of the pivotally mounted telescopic piston-cylinder assemblies 18, the outermost piston-rod ends of which coact with respective seatings 34 on the tilt-frame 3. The telescopic piston-cylinder assemblies 18 are connected in parallel with the main tilting piston-cylinder assemblies 19, which, subsequent to the telescopic piston-cylinder assemblies having carried out a maximum working stroke, form an angle with the tilt-

frame such as to enable said main tilting assemblies to take over the tilting function of the telescopic assemblies.

5 The carriage 7 therewith occupies its rear terminal position, with the piston rods retracted in respective cylinder housings, as shown in the detailed view of Figure 6.

10 As illustrated in Figure 7, the tilt-frame leaves the telescopic piston-cylinder assemblies 18 as tilting of said frame is continued with the aid of the main tilting piston-cylinder assemblies 19. In order to maintain the outermost piston-rod ends of the telescopic piston-  
15 cylinder assemblies in correct positions in readiness for the subsequently downwardly tilted frame, a pivotal rod 35 is mounted between a crosspiece which connects said piston-rod ends and the same pivot axle about which the tilt-frame 3 is swung.

20 In preparation for collection of a demountable load-unit, as hereinbefore defined, the lifting-and-locking device 5, 15 is swung down to the position illustrated in Figures 5 and 7 by means of the hydraulic piston-  
25 cylinder assemblies 15, these assemblies being supplied via the piston-cylinder assemblies which drive the carriage 7, as beforementioned. The open hook 16 can be brought into engagement with a rod or an eye on the load-unit. When the hook is in engagement with the plat-  
30 form, the hydraulic piston-cylinder assemblies 15 are placed under pressure, therewith causing the L-shaped device to be swung-up around its pivot axle 14 while simultaneously lifting-up the forward end of the load-unit on the tilt-frame 3. As the forward end of the  
35 platform is lifted, said forward end will engage the lever arm 17 and swing said arm towards the leg 5,

wherewith the opposite, hook-shaped part 38 of said arm will close the open hook 16. The demountable load-unit thus becomes self-locking by virtue of the described hook mechanism.

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Subsequent to lifting the forward end of the load-unit onto the rear part of the tilt-frame, the piston-cylinder assemblies which drive the carriage are activated so as to draw the load-unit up onto the tilt-frame while swinging down said frame at the same time.

10

When unloading a platform, the aforesaid working steps are carried out in a reverse order. A load-unit can also be off-loaded in a vertical position, when the carriage is located in its forward terminal position, by swinging the tilt-frame to a substantially vertical position. In this working position, the carriage 7 and the hook mechanism can be used as a lifting crane, by moving the carriage 7 vertically along the frame 3.

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Although the invention has been described with reference to an illustrated exemplifying embodiment thereof, it will be understood that modifications and changes can be made within the scope of the following claims. For instance, the piston-cylinder assemblies operative to drive the carriage 7 can be placed side-by-side instead of on top of one another.

25

CLAIMS

1. An arrangement in goods vehicles for handling load  
5 units, such as skips, containers, cisterns and like  
load-carrying devices, said arrangement comprising a  
tilt-frame (3) pivotally mounted on the rear part of the  
vehicle (1) and a carriage (7) which is movable along  
10 the tilt-frame and which is intended for coaction with  
the load units (2), at least two mutually adjacent  
hydraulic piston-cylinder assemblies (8,9) which func-  
tion to manouver said carriage (7) and which are mechan-  
ically connected together in a manner to enable the  
15 carriage (7) to be moved through a distance which corre-  
sponds substantially to the combined lengths of stroke  
of the piston-cylinder assemblies,  
c h a r a c t e r i z e d in that the piston rods  
(10,11) of both assemblies (8,9) are provided with two  
20 hydraulic-fluid passageways (21,26; 22,27) which commu-  
nicate with spaces on mutually different sides of the  
pistons (24, 25) in respective cylinders.
2. An arrangement according to Claim 1, c h a r a c -  
t e r i z e d in that the two cylinders (8,9) are  
25 mechanically fixated relative to one another and con-  
nected hydraulically together in parallel by means of  
hydraulic lines (30, 31) of fixed lengths.
3. An arrangement according to Claim 2, c h a r a c -  
30 t e r i z e d in that one piston rod (10) is connected  
to the tilt-frame (3) and the other piston rod (11) is  
connected to the carriage (7), and in that both piston  
rods (10,11) are provided with means (28,29; 32,33) for  
connection to said fluid passageways (21,26; 22,27) at  
35 their outer ends.

4. An arrangement according to Claim 1, c h a r a c -  
t e r i z e d in that one piston-cylinder assembly is  
connected to the tilt-frame; in that the other piston-  
cylinder assembly is connected to the piston rod of the  
5 first piston-cylinder assembly; in that the piston rod  
of the second piston-cylinder assembly is connected to  
the carriage; and in that said last mentioned piston rod  
(10) is provided with means for connection to said fluid  
passageways at its outer end.

10

5. An arrangement according to Claim 3, c h a r a c -  
t e r i z e d in that the fluid passageways (22,27) in  
the piston rod connected to the carriage (7) are con-  
nected to carriage-mounted hydraulically-operated devic-  
15 es (5,13) via electrically switchable valve devices.

6. An arrangement according to Claim 5, c h a r a c -  
t e r i z e d in that the carriage (7) includes hydrau-  
lically-operated devices (5, 13) for lifting a load unit  
20 onto the tilt-frame (3), said hydraulic devices (15)  
being intended to be placed under pressure for the  
purpose of performing a lifting movement when the piston  
rods (10,11) are in their retracted positions in the  
cylinders of said piston-cylinder assemblies.

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7. An arrangement according to Claim 6, c h a r a c -  
t e r i z e d in that said lifting devices (5, 13)  
include a gripping hook (16) having a pivotal locking  
arm (17, 38) which functions to close the hook upon  
30 coaction with the load units to be lifted.

8. An arrangement according to any one of Claim 1-7,  
c h a r a c t e r i z e d in that the arrangement  
includes at least one telescopic piston-cylinder assem-  
35 bly (18) which is operated to initiate tilting movement  
of the tilt-frame (3); and in that the position of the

outer piston-rod end of the telescopic piston-cylinder assembly is controlled with the aid of a rod (35) which is pivotal about the tilting axle (4) of said frame, said piston-rod end coacting with a seating (34) on the  
5 frame (3).



Fig. 1

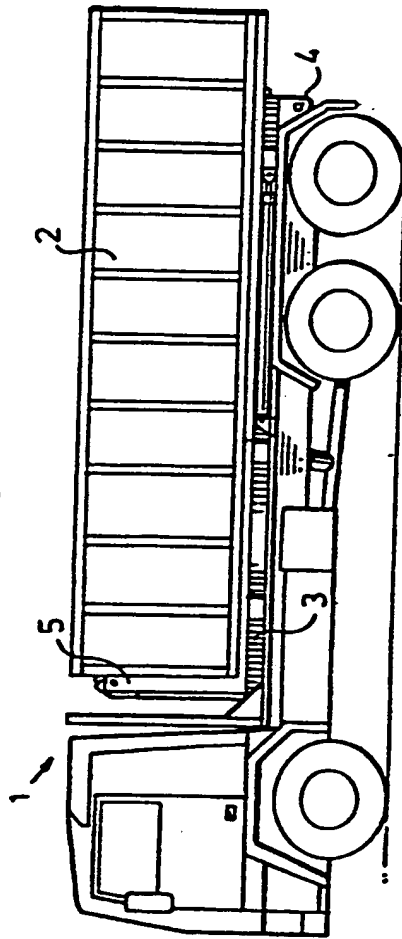


Fig. 4

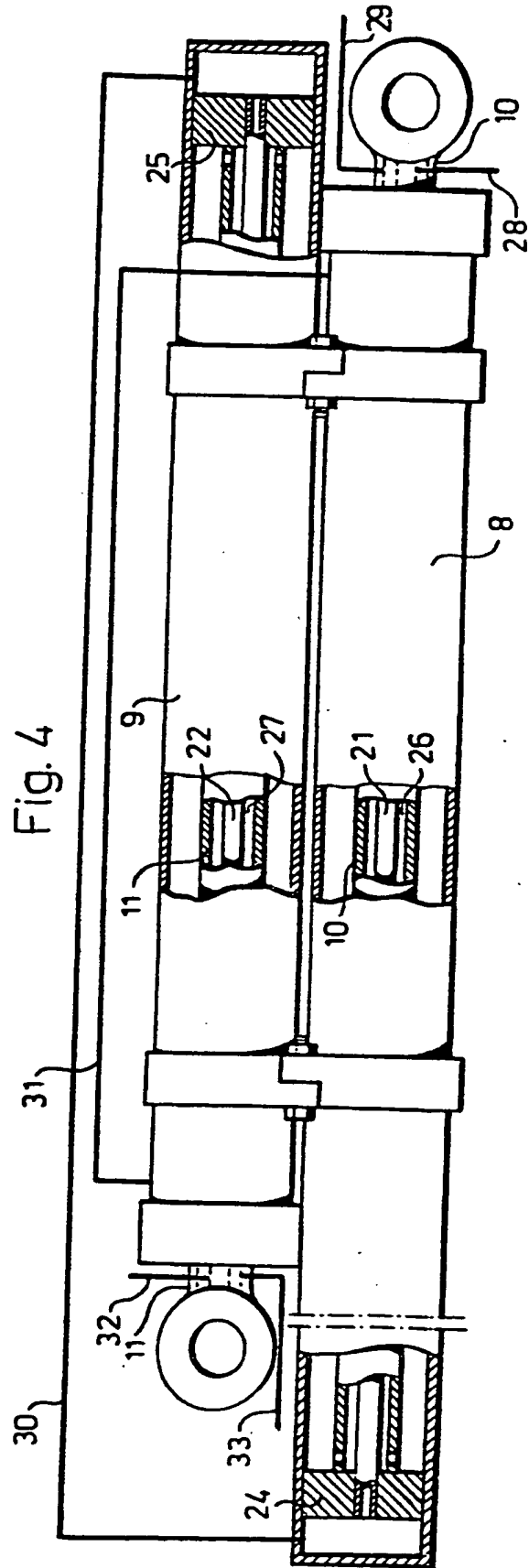


Fig. 2

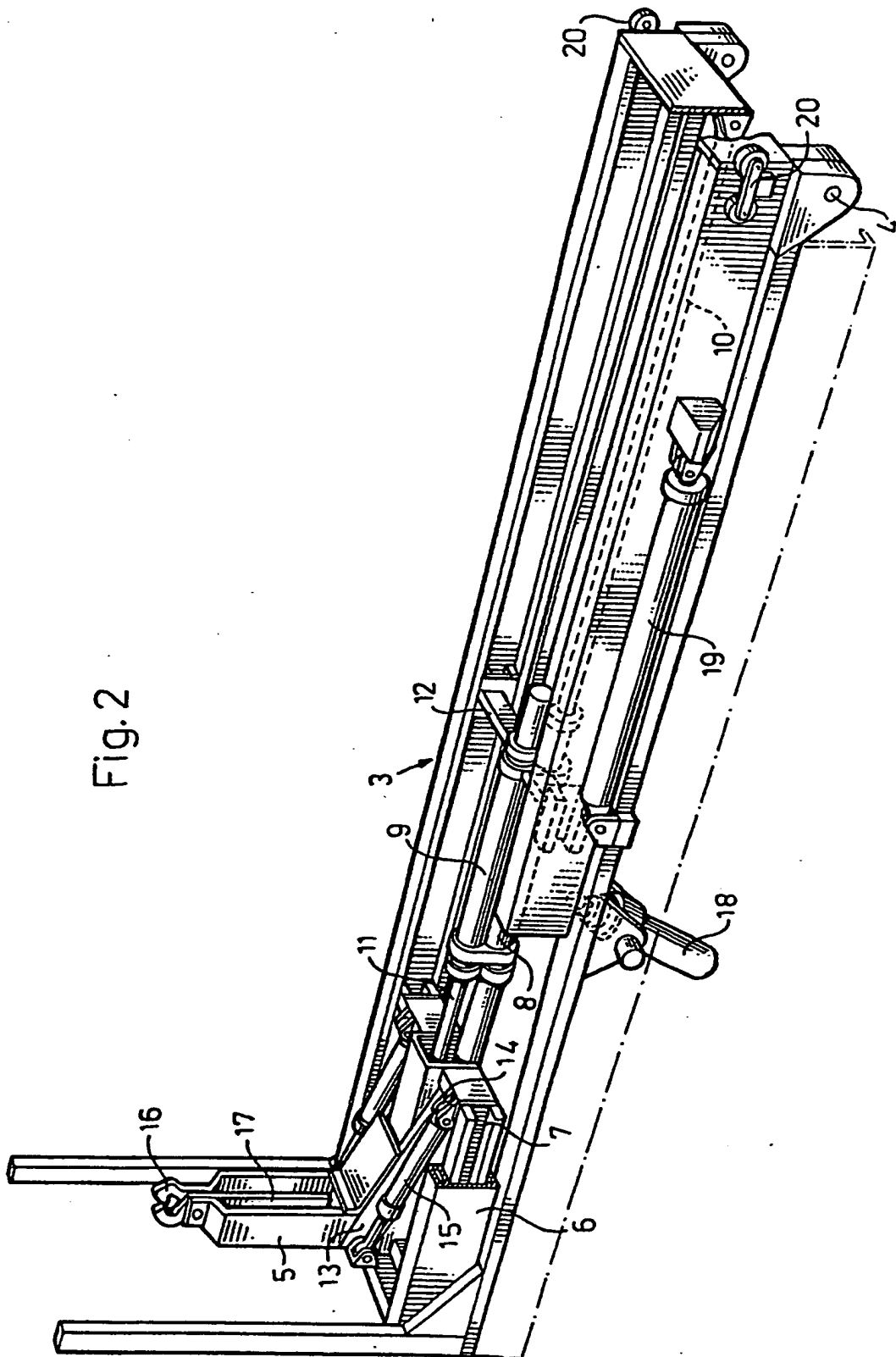


Fig. 6

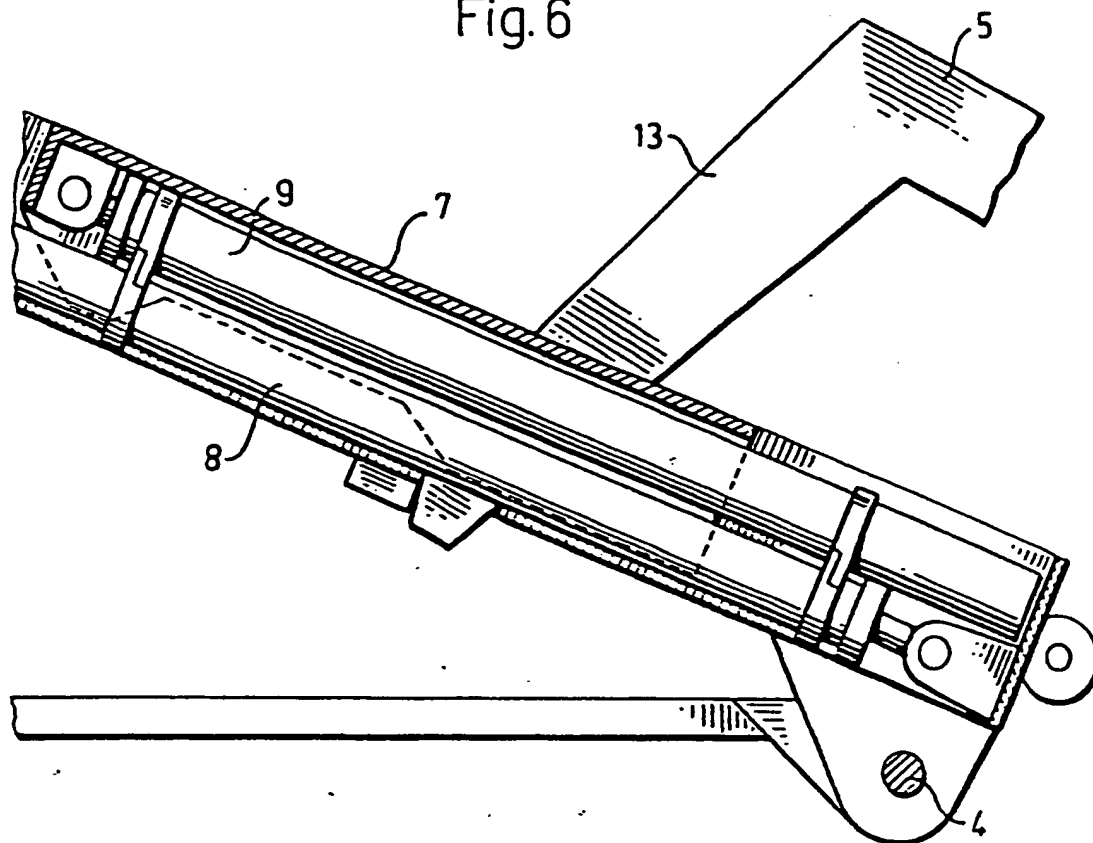


Fig. 3

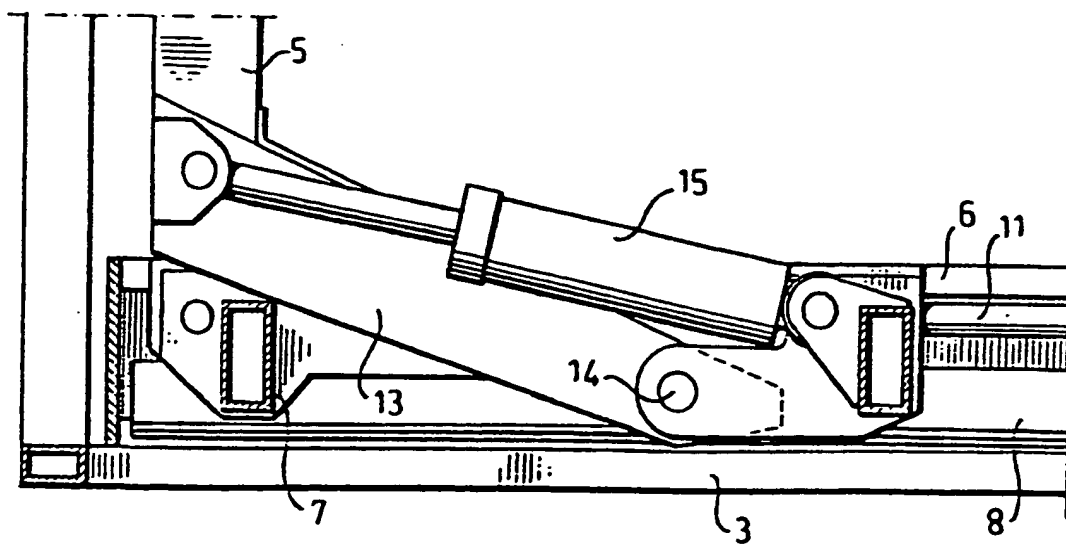
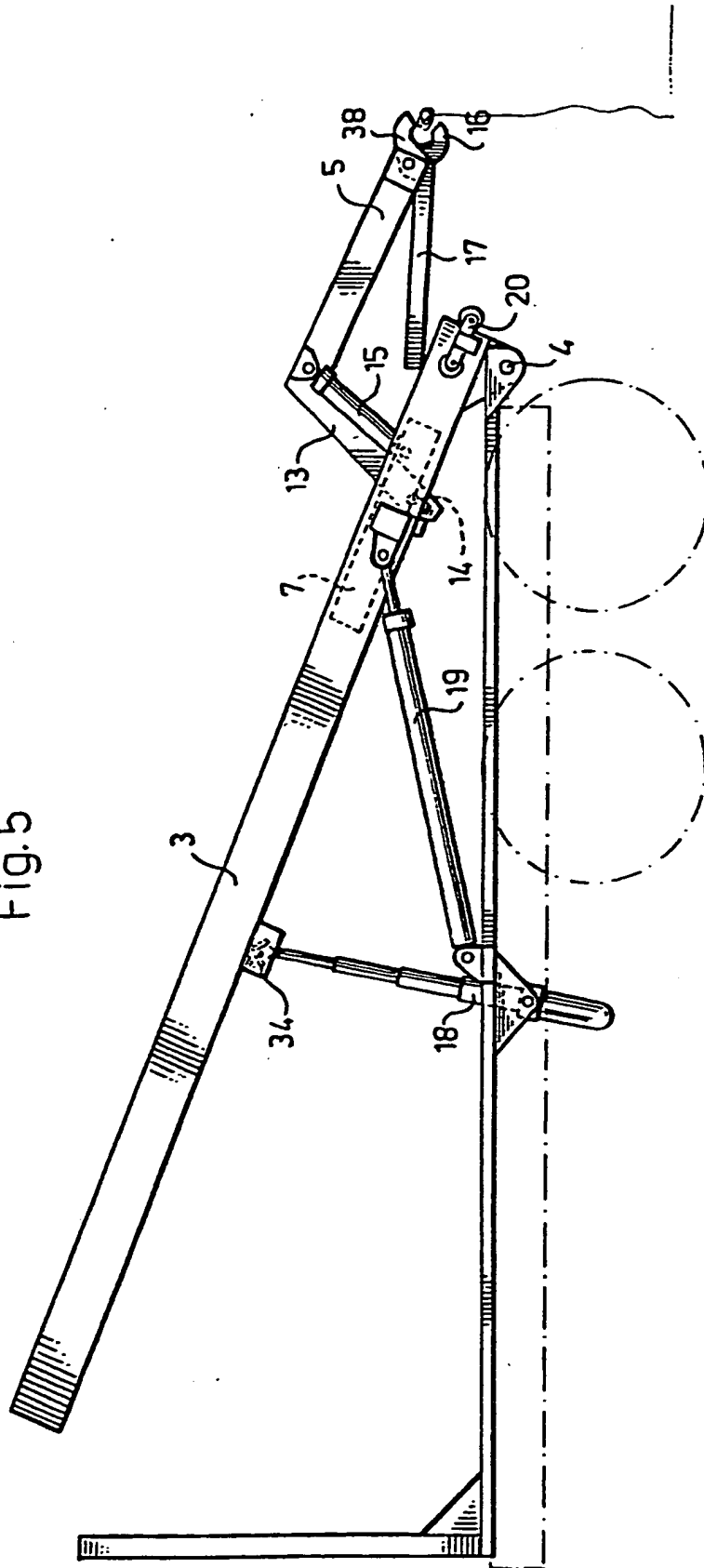
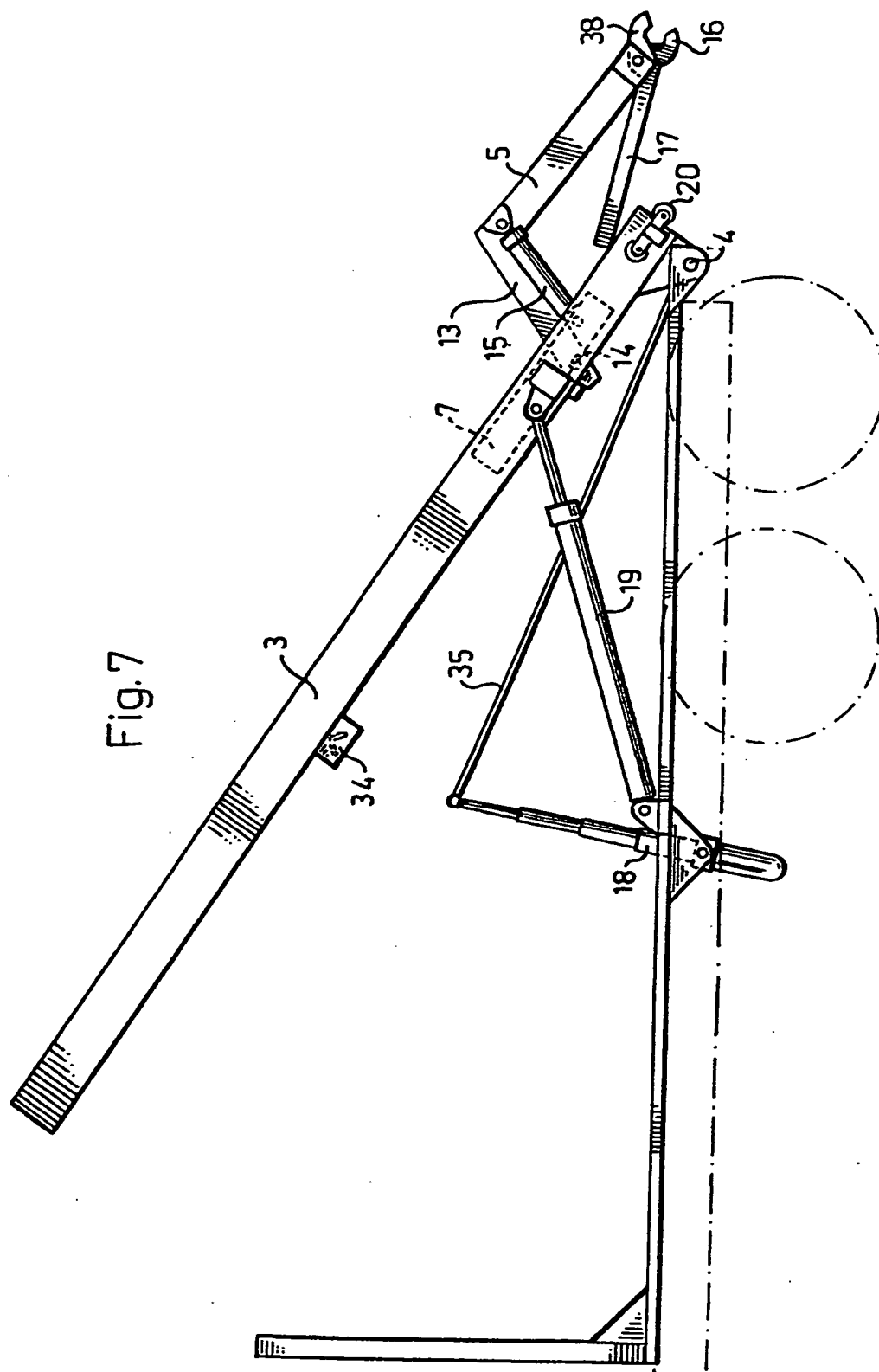


Fig. 5





# INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 90/00344

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup> According to International Patent Classification (IPC) or to both National Classification and IPC <b>IPC5: B 60 P 1/64, F 15 B 15/14</b>																							
<b>II. FIELDS SEARCHED</b> <div style="text-align: center; margin-top: 5px;">Minimum Documentation Searched<sup>7</sup></div> <table style="width: 100%; border: none;"> <tr> <td style="width: 20%; border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">Classification System</div> </td> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">Classification Symbols</div> </td> </tr> <tr> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">IPC5</div> </td> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">F 15 B; B 60 P; B 65 F; B 65 G; B 65 J</div> </td> </tr> </table> <div style="text-align: center; margin-top: 5px; font-size: small;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched<sup>8</sup></div> <p style="margin-top: 10px;">SE,DK,FI,NO classes as above</p>			<div style="border: 1px solid black; padding: 2px;">Classification System</div>	<div style="border: 1px solid black; padding: 2px;">Classification Symbols</div>	<div style="border: 1px solid black; padding: 2px;">IPC5</div>	<div style="border: 1px solid black; padding: 2px;">F 15 B; B 60 P; B 65 F; B 65 G; B 65 J</div>																	
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<div style="border: 1px solid black; padding: 2px;">IPC5</div>	<div style="border: 1px solid black; padding: 2px;">F 15 B; B 60 P; B 65 F; B 65 G; B 65 J</div>																						
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%; text-align: left; font-size: small;">Category *</th> <th style="width: 65%; text-align: left; font-size: small;">Citation of Document,<sup>11</sup> with indication, where appropriate, of the relevant passages<sup>12</sup></th> <th style="width: 30%; text-align: left; font-size: small;">Relevant to Claim No.<sup>13</sup></th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="vertical-align: top;">WO, A1, 8806985 (AB G.L.C. I FJUGESTA) 22 September 1988, see figures 1-5 --</td> <td style="text-align: center; vertical-align: top;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td style="vertical-align: top;">GB, A, 2036687 (DEERE &amp; COMPANY) 2 July 1980, see the whole document</td> <td style="text-align: center; vertical-align: top;">2</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="vertical-align: top;">--</td> <td style="text-align: center; vertical-align: top;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="vertical-align: top;">Patent Abstracts of Japan, Vol 7, No 24, M189, abstract of JP 57-178961, publ 1982-11-04 (SOYAO URIYUU), see figures 1-5 --</td> <td style="text-align: center; vertical-align: top;">1,2</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td style="vertical-align: top;">US, A, 4733598 (INNES ET AL) 29 March 1988, see the whole document</td> <td style="text-align: center; vertical-align: top;">2</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="vertical-align: top;">--</td> <td style="text-align: center; vertical-align: top;">1</td> </tr> </tbody> </table>			Category *	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>	Y	WO, A1, 8806985 (AB G.L.C. I FJUGESTA) 22 September 1988, see figures 1-5 --	1	X	GB, A, 2036687 (DEERE & COMPANY) 2 July 1980, see the whole document	2	Y	--	1	Y	Patent Abstracts of Japan, Vol 7, No 24, M189, abstract of JP 57-178961, publ 1982-11-04 (SOYAO URIYUU), see figures 1-5 --	1,2	X	US, A, 4733598 (INNES ET AL) 29 March 1988, see the whole document	2	Y	--	1
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<div style="display: flex; justify-content: space-between; font-size: small;"> <div style="width: 45%;"> <p><b>* Special categories of cited documents:<sup>10</sup></b></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p> </div> </div>																							
<b>IV. CERTIFICATION</b> <table style="width: 100%; border: none;"> <tr> <td style="width: 45%; border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">Date of the Actual Completion of the International Search</div> </td> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">Date of Mailing of this International Search Report</div> </td> </tr> <tr> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">14th August 1990</div> </td> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">1990-08-15</div> </td> </tr> <tr> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">International Searching Authority</div> </td> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">Signature of Authorized Officer</div> </td> </tr> <tr> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">SWEDISH PATENT OFFICE</div> </td> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">Åke Carlsson <i>Åke Carlsson</i></div> </td> </tr> </table>			<div style="border: 1px solid black; padding: 2px;">Date of the Actual Completion of the International Search</div>	<div style="border: 1px solid black; padding: 2px;">Date of Mailing of this International Search Report</div>	<div style="border: 1px solid black; padding: 2px;">14th August 1990</div>	<div style="border: 1px solid black; padding: 2px;">1990-08-15</div>	<div style="border: 1px solid black; padding: 2px;">International Searching Authority</div>	<div style="border: 1px solid black; padding: 2px;">Signature of Authorized Officer</div>	<div style="border: 1px solid black; padding: 2px;">SWEDISH PATENT OFFICE</div>	<div style="border: 1px solid black; padding: 2px;">Åke Carlsson <i>Åke Carlsson</i></div>													
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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
X	Patent Abstracts of Japan, Vol 7, No 163, M229, abstract of JP 58- 68507, publ 1983-04-23 (TADANO TEKKOSHO K.K.), see figure 2  --  -----	2
Y		1

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO. PCT/SE 90/00344**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.  
The members are as contained in the Swedish Patent Office EDP file on **90-06-27**  
The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A1- 8806985	88-09-22	AU-D- SE-A-	1480088 8700976 88-10-10 88-09-10
GB-A- 2036687	80-07-02	AU-B- AU-D- BE-A- CA-A- DE-A-C- FR-A-B- NL-A- US-A-	523663 5275179 880396 1132619 2948715 2443191 7908711 4220280 82-08-05 80-06-12 80-04-01 82-09-28 80-06-12 80-07-04 80-06-06 80-09-02
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